

Appl. No. 09/967,174  
Amdt. dated 10/12/2005  
Reply to Office Action of 07/11/2005

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (currently amended):

A method of switching a Label Switch Path (LSP) rewriting tunnel labels in a multiprotocol label switching (MPLS) network, network by a Label Switch Router (LSR), the method comprising:

mapping one or more virtual circuit (VC) labels associated with a first tunnel label to a first group identification (GID);

mapping the first GID with the first tunnel label;

remapping the first GID with a second tunnel label; and

forwarding a datagram having a VC label associated with the first tunnel label using a the second tunnel label instead of the first tunnel label by mapping the first GID with the second tunnel label.

2. (original):

The method of claim 1, wherein the datagram includes the VC label that is associated with the first tunnel label before the first GID is mapped with the second tunnel label.

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3. (original):

The method of claim 1, wherein mapping the first GID with the second tunnel label comprises rewriting the first tunnel label with the second tunnel label in the mapping of the first GID with the first tunnel label.

4. (original):

The method of claim 1, further comprising mapping one or more VC labels associated with a third tunnel label to a second GID, the second GID being different from the first GID.

5. (currently amended):

A method of maintaining tunnel ~~labels~~, labels by a Label Switch Router (LSR), the method comprising:

forming a label table that maps ~~different groups of~~ virtual circuit (VC) labels to ~~different~~ group identifications (GIDs), each of the VC labels that was previously mapped to a same tunnel label being mapped to a same group identification; in a group of VC labels being associated with a common tunnel label;

forming a GID table that maps each of the different GIDs to a different tunnel ~~label;~~ label that identifies an adjacent LSR; and

forwarding ~~datagrams a datagram~~ using a VC label associated with the datagram to determine a GID for the datagram from the VC labels in the label table and using the determined GID to determine a tunnel label for the datagram from the tunnel labels in the GID table.

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6. (currently amended):

The method of claim 5, further comprising associating the VC labels in a group of VC labels having the same GID with a new common tunnel label by updating the GID table to reflect the new common tunnel label.

7. (original):

The method of claim 6, wherein updating the GID table to reflect the new common tunnel label comprises rewriting one entry in the GID table with the new common tunnel label.

8. (original):

The method of claim 6, further comprising forwarding the datagrams using the new common tunnel label by using the VC labels in the label table and the new common tunnel label in the GID table.

9. (original):

The method of claim 5, wherein the GID table further maps each of the different GIDs to a different backup tunnel label such that when a backup tunnel label indicator is set, the datagrams are forwarded using the backup tunnel label.

10. (original):

The method of claim 9, wherein the backup tunnel label is used without having to rewrite the tunnel labels in the GID table.

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11. (original):

The method of claim 10, wherein the backup tunnel label is used when there is a link error.

12. (currently amended):

A computer readable medium having stored thereon sequences of instructions which are executable by a system, and which, when executed by the system, cause the system to:

form a label table that maps ~~different groups of~~ virtual circuit (VC) labels to ~~different~~ group identifications (GIDs), each of the VC labels that was previously mapped to a same tunnel label being mapped to a same group identification; in a group associated with a common tunnel label;

form a GID table that maps each of the different GIDs to a different tunnel ~~label;~~ label that identifies an adjacent LSR; and

forward ~~datagrams~~ a datagram using a VC label associated with the datagram to determine a GID for the datagram from the VC labels in the label table and using the determined GID to determine a tunnel label for the datagram from the tunnel labels in the GID table.

13. (currently amended):

The computer readable medium of claim 12, further comprising instructions to associate the VC labels in a group of VC labels having the same GID with a new common tunnel label by updating the GID table to reflect the new common tunnel label.

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14. (original):

The computer readable medium of claim 13, wherein the instructions to update the GID table to reflect the new common tunnel label comprises instructions to rewrite one entry in the GID table with the new common tunnel label.

15. (original):

The computer readable medium of claim 13, further comprising instructions to forward the datagrams using the new common tunnel label by using the label table and the GID table.

16. (original):

The computer readable medium of claim 15, wherein the instructions to forward datagrams using the label table and the GID table comprises instructions to use the GIDs in the label table to get the tunnel labels in the GID table.

17. (original):

The computer readable medium of claim 12, wherein the instructions to form the GID table further comprises instructions to map each of the different GIDs to a different backup tunnel label such that when a backup tunnel label indicator is set, the datagrams are forwarded using the backup tunnel label.

18. (original):

The computer readable medium of claim 17, wherein the backup tunnel label is used without having to rewrite the tunnel labels in the GID table.

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19. (original):

The computer readable medium of claim 18, wherein the backup tunnel label is used when there is a link error.

20. (currently amended):

An apparatus, comprising:

a bus;

a memory coupled to the bus;

a processor coupled to the memory and the bus, the processor configured to

form a label table that maps virtual circuit (VC) labels to group identifications (GIDs), each of the VC labels that was previously mapped to a same tunnel label being mapped to a same group identification,

form a GID table that maps each of the different GIDs to a different tunnel label that identifies an adjacent LSR, and

forward datagrams a datagram in a multiprotocol label switching (MPLS) network using a VC label associated with the datagram to determine a GID for the datagram from the label table and a group identification (GID) table, wherein the label table maps different groups of virtual circuit (VC) labels to different group identifications (GIDs), each of the VC labels in a group associated with a common tunnel label, and wherein the GID table maps each of the different GIDs to a different tunnel label, using the determined GID to determine a tunnel label for the datagram from the tunnel labels in the GID table.

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21. (original):

The apparatus of claim 20, wherein when the datagrams cannot be forwarded to an egress router with a current label switch path (LSP) using a current tunnel label in the GID table, a new tunnel label is used by rewriting the current tunnel label with the new tunnel label in the GID table.

22. (original):

The apparatus of claim 20, wherein when the datagrams cannot be forwarded to a next router using a current tunnel label in the GID table, a backup tunnel label in the GID table is used by setting a backup tunnel label indicator, the backup tunnel label corresponding to the GID associated with the current tunnel label.

23. (original):

The apparatus of claim 22, wherein the backup tunnel label is associated with a backup router, and wherein the backup router uses the current tunnel label in the GID table to forward the datagram from the backup router to the next router.

24. (currently amended):

An apparatus, comprising:

means for forming a label table that maps virtual circuit (VC) labels to group identifications (GIDs), each of the VC labels that was previously mapped to a same tunnel label being mapped to a same group identification;

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means for forming a GID table that maps each of the different GIDs to a different tunnel

label that identifies an adjacent LSR; and

means for forwarding datagrams a datagram in a multiprotocol label switching (MPLS)

network using a VC label associated with the datagram to determine a GID for the

datagram from the label table and group identification (GID) table, wherein the label

table maps different groups of virtual circuit (VC) labels to different group identifications

(GIDs), each of the VC labels in a group associated with a common tunnel label, and

wherein the GID table maps each of the different GIDs to a different tunnel label. using

the determined GID to determine a tunnel label for the datagram from the tunnel labels in

the GID table.

25. (original):

The apparatus of claim 24, further comprising means for using a new tunnel label to forward the datagrams to an egress router with a current label switch path (LSP) instead of a current tunnel label when the datagrams cannot be forwarded using the current tunnel label.

26. (currently amended):

The apparatus of claim 24, further comprising means for using a backup tunnel label in the GID table to forward the datagrams to a next router instead of a current tunnel label when the datagrams cannot be forwarded to the next router using the current tunnel label, the backup tunnel label on the label stack above the current tunnel label and corresponding to the GID associated with the current tunnel label.



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27. (original):

The apparatus of claim 26, further comprising means for enabling the backup tunnel label such that the backup tunnel label in the GID table is used to forward the datagrams to the next router.

28. (original):

The apparatus of claim 26, further comprising means for the using the current tunnel label in the GID table to forward the datagrams from the backup router to the next router.

29. (currently amended):

A Label Switch Router (LSR). An apparatus, comprising:

a bus;

a memory coupled to the bus;

a processor coupled to the memory and the bus, the processor to

map maps one or more VC labels associated with a first tunnel label to a first group identification (GID),

map maps the first GID with the first tunnel label,

remap the first GID with a second tunnel label, and

forward forwards a datagram having a VC label associated with the first tunnel label using a the second tunnel label instead of the first tunnel label by mapping the first GID with the second tunnel label.

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30. (original):

The apparatus of claim 29, wherein the datagram includes the VC label that is associated with the first tunnel label.

31. (original):

The apparatus of claim 29, wherein the processor maps the first GID with the second tunnel label by rewriting the first tunnel label with the second tunnel label.

32. (original):

The apparatus of claim 29, wherein the processor further maps one or more VC labels associated with a third tunnel label to a second GID, the second GID being different from the first GID.

33. (currently amended):

A computer readable medium having stored thereon sequences of instructions which are executable by a system, and which, when executed by the system, cause the system to:

map one or more virtual circuit (VC) labels associated with a first tunnel label to a first group identification ~~(GID)~~; (GID) in a Label Switch Router (LSR);

map the first GID with the first tunnel label;

remap the first GID with a second tunnel label; and

forward a datagram having a VC label associated with the first tunnel label using a the second tunnel label instead of the first tunnel label ~~by mapping the first GID with the second tunnel label.~~

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34. (original):

The computer readable medium of claim 33, wherein the datagram includes the VC label that is associated with the first tunnel label before the first GID is mapped with the second tunnel label.

35. (original):

The computer readable medium of claim 33, wherein the instructions to map the first GID with the second tunnel label comprises instructions to rewrite the first tunnel label with the second tunnel label in the mapping of the first GID with the first tunnel label.

36. (original):

The computer readable medium of claim 33, further comprising instructions to map one or more VC labels associated with a third tunnel label to a second GID, the second GID being different from the first GID.